Los Alamos Neutron Science Center gets capacity boost

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Los Alamos National Security funds upgrade to key facility

LOS ALAMOS, New Mexico, December 2, 2010—The National Nuclear Security Administration's Los Alamos Site Office and Los Alamos National Security, LLC, the contractor that operates Los Alamos National Laboratory, have agreed to allocate money LANS could have earned from its prime contract fee to upgrade a facility serving industrial designers and researchers at the Los Alamos Neutron Science Center that helps ensure the reliability of semiconductor chips.

In early 2011, LANSCE—one of the nation's highest intensity linear proton accelerators—will begin upgrades that will effectively double the facility's capacity for experiments and tests on electronic devices by Laboratory, industrial, and academic users.
The facility has been used for more than a decade by a virtual Who's Who of the

semiconductor industry to simulate the potential failures posed by cosmic-ray-induced neutrons upon miniature electronic devices, such as chips that help control aircraft or complex integrated circuits in automobiles. The facility can simulate the effects of hundreds or thousands of years of cosmic-ray-induced neutrons in a single hour. This same capability also aids scientists in understanding how components of nuclear weapons age.

“The Los Alamos Neutron Science Center has consistently shown its value to the nation,” said LANL Director Michael Anastasio, president of LANS, LLC. “We are extremely pleased to be able to reinvest in a key LANL facility to ensure continuing scientific excellence and national service.”

Knowing how integrated circuitry will perform is important. When cosmic rays from space strike Earth’s upper atmosphere, they unleash a shower of neutrons. While the radioactive dose from these showers is relatively harmless to human health, each neutron can interact with integrated circuits to produce charged particles that can potentially disrupt normal operation of devices and the data that is stored within them.

“As integrated circuitry gets smaller and smaller, and operating voltages decrease, the potential for these single-event upsets rises dramatically,” said Steve Wender, leader of LANSCE’s neutron and nuclear science group. “Although, the probability that a neutron will disrupt a particular circuit is extremely small—something you might never see during the practical life of the device—the large number of semiconductor devices used in everyday life make the total number of failures significant. At our ICE (Irradiation of Chips and Electronics) House facility, we can simulate hundreds of years of life of a device in a short time, allowing circuit manufacturers to better understand risks of cosmic-ray-generated neutrons and potentially incorporate strategic designs to cope with the risks. Consequently, ICE House has become an international standard for putting new circuits through their paces.”

The facility’s popularity has generated more potential users than available beam time. In addition to industrial users, Los Alamos scientists increasingly use the facility to accomplish the Laboratory’s central mission of ensuring the safety and reliability of the nation’s nuclear weapons stockpile. Several key stockpile stewardship questions could not be easily answered without ICE House.

Industry users such as Honeywell, Intel, Oracle, Texas Instruments, AMD, Freescale, and others have used the ICE House facility; the tests have also played a key role in helping Los Alamos fine-tune its own supercomputers.

At the end of this year’s LANSCE beam cycle, construction will begin on a 4,000-square-foot building that will house additional experimental capacity.

This additional capacity will allow the semiconductor companies to not only have more beam time, but also allow them to better coordinate beam tests with their production schedules. The upgrade should cost about $2 million. The newly upgraded facility is expected to be operational by July 2011.

“When complete, we will be able to double our industrial capacity and our availability for stockpile stewardship activities,” said Kurt Schoenberg, deputy associate director for Experimental Physical Sciences. “The increased capacity and upgraded instrumentation are a first step toward development by Los Alamos of a future signature facility to help scientists create better materials by design and to understand materials behavior in extreme conditions.”


NNSA
National Nuclear Security Administration